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Relationship of Private Entrances to Highway Efficiency

Ontario

Ministry of Transportation

Research and Development Branch

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Relationship of Private Entrances to Highway Efficiency

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Abstract:	The relationship between accident rate and access spacing along provincial highways was examined as part of a review of the Ministry's access control policies. A literature search was conducted on access spacing and pertinent articles were summarized. Based on a comprehensive analysis of the operational characterisitics of representative road sections, threshold values for access spacing were determined. These threshold values were used to produce access control guidelines for the Ministry. From a comparison of roadway sections, potential mitigating techniques to reduce the accident rate were identified.
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Ontario
Ministry of Transportation
Ministère des Transports

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M3M 1J8

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Attached herewith is a copy of the report "Relationship of Private Entrances to Highway Efficiency".

The report was prepared by M.M. Dillon Ltd., at the request of the Ministry of Transportation. The primary objective of the research project described in this report was to examine the relationship between accident rate and access spacing along provincial highways as part of a review of the Ministry's access policies. Based on a comprehensive analysis of the operational characteristics of representative road sections, threshold values for access spacing were determined. These threshold values were used to produce access control guidelines for the Ministry.

We hope that you will find our research work useful to you and your staff.

Sincerely yours,

E.R. Case
Manager
Traffic and Decision Systems Office
Research and Development Branch

encl.

TDS-88-03

Relationship of Private Entrances to Highway Efficiency

J.P. Horton

L. Sillaste

M.M. Dillon Limited

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D.G. Hobbs, Deputy Minister

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November 1988

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EXECUTIVE SUMMARY

This study examines the relationship between accident rate and access spacing along Provincial highways as part of a review of the Ministry's access policies. The Ministry's current policy is to allow 14 private access points and 5 public access points for a total of 19 access points per kilometre.

In total, 205 kilometres of highway sections, divided into two and four-lane, and high and low speed facilities were examined. In all, 2642 access points, divided into commercial, public and residential access points, were examined.

The analysis revealed:

1. On four-lane highways:
   - there is a large increase in the accident rate for densities between four and eight commercial and public access points per kilometre;
   - above eight commercial and public access points per kilometre the accident rate is three to four times the Provincial average.

2. On two-lane highways:
   - most (86%) of the highway sections examined had fewer than 8 commercial and public access points per kilometre;
   - for these sections, the accident rate was evenly distributed and ranged from 0 to 2.5 accidents per million vehicle kilometre. No apparent trend between increasing access density and accident rate was evident.

1. INTRODUCTION

1.1 Study Purpose

This report documents the research conducted as part of the study "Relationship of Private Entrances to Highway Efficiency". The study is being conducted to quantify the relationship between access density and accident rate as input into the Ministry's access control policies and guidelines. The study was undertaken to address concerns over the preservation and safety of the existing Provincial Highway System.

1.2 Study Process

The following sections describe the study findings and methodology.

MTO Current Policy (Section 2)

- A brief description of the ministry's current access control policies is presented.

Literature Review Summary (Section 3)

- A literature search was conducted on access spacing. This section summarizes the pertinent articles.

Data Collection (Section 4)

- The information collected for each study section is described and the source of the data is identified.

Analysis (Section 5)

- The relationship between access spacing and the operational characteristics of the study sections was analyzed. This section documents the findings of that analysis.

Mitigation (Section 6)

- Potential mitigating techniques to reduce the roadway accident rate are identified.

1.3 Study Organization

The project was directed by a Steering Committee comprised of:

Mr. A. Zembal - Manager
Transportation Corridor Management Office
Ministry of Transportation

Ms. M. Hillier - Senior Planner
Transportation Corridor Management Office
Ministry of Transportation

Mr. A. Ugge - Project Research Engineer
Research and Development Branch
Ministry of Transportation

Mr. A. Bacchus - Research Engineer
Research and Development Branch
Ministry of Transportation

2. MTO CURRENT POLICY

The Provincial Highway System is divided into five classes for land access control purposes. They are:

Class 1	Freeways and Expressways
Class 2	Staged Expressways and Freeways
Class 3	Special Controlled Access Highways
Class 4	Major Highways
Class 5	Minor Highways

The most important highways are included in Class 1 and cannot tolerate any direct access while Class 2 to Class 5 highways can tolerate increasing degrees of access.

The road sections investigated in this study fall mainly into either Class 3 or Class 4 highways. These two classes of highways experience the most pressure from private development access proposals.

Class 5 highways may also experience significant pressure, but the Ministry's controls are more lax as these highways are considered to be of Regional not Provincial significance.

For Class 3 highways, existing direct access points are allowed to remain but entrances for new ownerships are permitted only for very large frontages or within settled areas. The minimum entrance spacing for Class 3 highways is somewhat greater than Class 4 highways as specified in individual criteria. Upgrading of a residential or farm entrance to a commercial/industrial/institutional entrance may not be approved.

Existing access points are allowed to remain for Class 4 highways. New direct entrances are permitted to serve new ownerships if no

alternate access exists, and one of the following two conditions is met:

1. The section is substantially developed and will be bypassed in the near future.

2. The owner has a minimum frontage of 300 m (1000 ft.) so that the minimum distance between entrances will be 150 m (500 ft.) following severance.

An entrance spacing of one entrance per 500 ft. per side is equivalent to an access density of 14 private access points per km. On average, 5 public access points per km. are allowed, resulting in a total of 19 access points per km. (This is considerably lower than many study sections found in the literature study, (see Section 3)).

The conversion of an existing entrance to a mutual entrance serving two owners or two or more main buildings on one ownership may be considered for Class 3 and 4 Highways.

At grade public road entrances will be considered for Classes 2, 3, 4 and Class 5 Highways.

3. LITERATURE REVIEW SUMMARY

A literature search was conducted utilizing the Ministry of Transportation library services. Thirteen pertinent articles were identified and copies of these were obtained and reviewed. The following summarizes their findings.

Most articles reviewed studied the relationship of accident rates to the physical and traffic characteristics of the roadway. Accident rates were found to increase as the traffic volume of the roadway increased. This was supported by the findings of this study for four lane highways (see Section 5.4 and 5.5).

Several articles concluded that the number of commercial driveways per kilometre was the most important factor in the frequency of accidents. This study identified commercial access points as an important factor with public access points being the predominant factor.

Other factors, not examined in this study, which were considered to be important included the number of commercial units, the roadside development and the shoulder width.

A number of studies found no relationship between the number of residential driveways per kilometre and the accident rate.

On low volume roads, the accident rate was not related to any roadway feature. Our analysis conducted for this study strongly supports this finding.

Most of the studies reported problems of obtaining consistent and meaningful accident data. There were also problems in establishing how each highway descriptive variable affected the accident rate because the variables are often correlated. These problems were encountered in this study and are inherent in any type of accident analysis.

Several articles evaluated various techniques for reducing traffic conflicts at commercial driveways. The consensus of the articles was that two-way left-turn lanes significantly reduce the number of accidents. Installation of alternating left-turn lanes and raised median dividers with left-turn deceleration lanes also provide a substantial reduction in accidents. These findings were supported by our analysis of mitigation techniques (see Section 6).

Several American studies examined access densities greater than 40 access points per km. These sections experienced a driveway-related accident rate of approximately 6.2 accidents per million vehicle kilometres. On Ontario highways, the commercial and public access density was always below 25 access points per km. and generally did not experience an accident rate of greater than 5 accidents/Mv-km.

Appendix A summarizes each of the thirteen articles reviewed.

4. DATA COLLECTION

4.1 Roadway Categories

Initially, six categories which represent the full range of roadways having private access within the province were defined. These were:

1. high volume, high speed (80 km/h)*, four plus lane facilities;
2. high volume, low speed (60 km/h), four plus lane facilities;
3. high volume, high speed (80 km/h), two lane facilities;
4. high volume, low speed (60 km/h), two lane facilities;
5. low volume, high speed (80 km/h), two or four lane facilities;
6. very low volume, high speed (80 km/h), two or four lane facilities.

4.2 Sections

Representative sections of varying length were determined for each of the six roadway categories outlined in Section 4.1. The Ministry's Transportation Corridor Management Office identified several known problem areas with input from Regional and District Offices.

There were difficulties in obtaining a sufficient number of sections for Category 4, high volume, low speed, two lane facilities. The 60 km/h speed zones usually occur within towns and hamlets, and thus, these sections are quite short. In areas where there are longer section of 60 km/h roadway, these have usually been transferred to the municipality and the MTO does not record accident data.

---

* Posted Speed

Very few sections were identified for Category 5 and 6, low and very low volume, high speed, two or four lane facilities. These roadways generally do not exhibit significant problems as they are predominantly in remote areas with little direct access and low accident rates. A few sections were included in the analysis for comparison purposes.

The sections were reduced to 1 km in length. The purpose of this conversion was two-fold: to provide more data points for analysis and also ensure that the access density and roadside environment will be consistent throughout the length of a section.

4.3 Operational Characteristics

The following information was collected and entered into a computer spreadsheet (see Appendices B and C).

4.3.1 Number of Access Points

Information on the number and location of access points along the sections was acquired from Engineering Title Records (ETR's). For areas where ETR's were not available either contract drawings, B plans or the Ministry's photo inventory were used to locate access points. Commercial, public and residential access points were counted separately.

The definition of an access point was reviewed with the Transportation Corridor Management Office and the following guidelines developed. A single commercial establishment with in/out driveways separated by a raised island was counted as one commercial access point. An entrance serving more than one commercial establishment, such as a shopping mall, was again counted as one commercial access point.

A public roadway intersecting and continuing on both sides of the road section was counted as two public access points. A looping, semi-circular residential driveway was counted as one residential access point, as was one shared driveway serving two residential units.

4.3.2 Accidents

The number of total accidents and private drive-related accidents for each section was obtained from the Ministry's accident data information system through the Traffic Office. Information by 0.1 km intervals within each section was provided. The number of accidents for 1983, 1984 and 1985 was averaged and converted into an accident rate. The accident rate is defined as the number of reportable accidents occuring annually for every million vehicle kilometres travelled on a road section.

Although the number of both driveway related and total accidents had been collected for each highway section, it was decided that the total accident rate would be the best measure of efficiency as it is the measure most widely used by the Ministry. Consequently, the number of driveway related accidents was not used in the analysis of the sections.

For the purposes of this study, all of the accidents which occurred at the intersections of local roads and the Ministry's highways were assumed to occur along the Ministry's Highway. If both intersecting roads were under the Ministry's jurisdiction then the number of accidents were evenly split between the two highways. At intersections occurring at the limits of the sections, half of the number of accidents at the intersection were assumed to occur within the section limits.

4.3.3 Traffic Volumes

The volume of each section was taken as the 1984 Annual Average Daily Traffic (AADT) as recorded in the "Highway Inventory Select Information (1985)" booklet. This value is defined as the average twenty-four hour, two-way traffic for the period from January 1st to December 31st.

4.3.4 Speeds and Level of Service

The Ministry's Provincial Highway Appraisal sheets provided the actual speed, the posted speed and the level of service for most of the road sections. However these values may not accurately represent actual field conditions in sufficient detail for the purposes of this study.

4.3.5 Peaking Pattern

The traffic flow peaking pattern represents the seasonal variability of the traffic flow within each section. The pattern was obtained from the "1983 Traffic Volumes" booklet, and is described by one of the following nine pattern types:

1. URB CMTR: Urban Commuter
2. SUB CMTR: Suburban Commuter
3. COMMUTER: Commuter
4. INTER CMTR: Intermediate Commuter
5. COMM REC: Commuter Recreation
6. CMT-TR-REC: Commuter-Tourist-Recreation
7. INTER TOUR: Intermediate Tourist
8. LOW REC: Low Recreation
9. LOW TOURIS: Low Tourist

4.3.6 Number of Lanes, Roadside Environment

Both the number of lanes and the adjacent roadside environment were obtained from ETR's, contract drawings, B plans or the photo inventory. The roadside environment was classified into one of four groups; rural, residential, commercial or mixed. A mixed roadside environment was defined as an even mixture of residential and commercial development.

5. ANALYSIS

The data collected and shown in Appendices B and C was subject to the following analysis.

5.1 Access Spacing Vs. Speed

The purpose of the analysis was to determine if increased access density decreased the actual speed of a roadway. Two groups of study sections were analyzed. The first group consisted of Category 1 and 3 study sections with a posted speed of 80 km/h . The second group consisted of Category 2 study sections with a posted speed of 60 km/h . Category 4 study sections were not analyzed, due to a lack of data. For both groups the total access density was plotted against the actual speed of the roadway. The total access density is defined as the sum of the commercial, public and residential access densities. These graphs are shown in Appendix D. This appendix is not included here. It may be obtained separately from the Research and Development Branch.

The results of this analysis were inconclusive. No clear relationship was evident from the plotted data points.

5.2 Access Spacing Vs. Level of Service

This analysis was undertaken to determine if increased access density results in a lower level of service. Category 1 and 2 study sections were combined to represent high volume, four plus lane facilities. Category 3 and 4 study sections were combined to represent high volume, two lane facilities. The total access density was plotted against the level of service of the study section for each combined group. These graphs are shown in Appendix E. This appendix is not included here. It may be obtained separately from the Research and Development Branch.

No trend was apparent from the plotted data points.

5.3 Operational Characteristics vs. Accident Rate

The intent of this analysis was to identify operational characteristics that affect the accident rate. Data for all two and four-lane facilities were analyzed by multiple regression. The independent variables used were: commercial, public and residential access point density, level of service and peaking pattern. The dependent variable was the accident rate.

Table 5.3 summarizes the results of the analysis.

For four-lane, high speed facilities only the public access point density was significant, with a coefficient of multiple determination, $R^2 = 0.56$. The coefficient of multiple determination measures the proportion of total variation about the mean explained by the regression.

For both two and four-lane, low speed sections, none of the variables were significant at a 5% level.

For two-lane, high speed sections, commercial and public access density had the highest coefficients of multiple determination. The commercial access point density was significant at a 5% level.

Residential access point density, level of service and peaking pattern were not significant for any of the facility categories analyzed. Consequently, these variables were omitted from further analysis.

TABLE 5.3

Summary of Multiple Regression Analysis

Facility	Individual Variable			Equation	
	Variable	Pairwise Correlation Coefficient	Significant @ 5% level	R^2	Significant @ 5% level
Four-lane High Speed	commercial	0.00	no	0.59	yes
	public	0.56	yes		
	residential	0.03	no		
	LOS	0.01	no		
	Peaking Pattern	0.12	no		
Four-lane Low Speed	commercial	0.01	no	0.00	no
	public	0.14	no		
	residential	0.16	no		
	LOS	0.00	no		
	Peaking Pattern	0.19	no		
Two-lane High Speed	commercial	0.26	yes	0.25	yes
	public	0.24	no		
	residential	0.02	no		
	LOS	0.01	no		
	Peaking Pattern	0.01	no		
Two-lane Low Speed	commercial	0.21	no	0.00	no
	public	0.47	no		
	residential	0.21	no		
	LOS	0.00	no		
	Peaking Pattern	0.11	no		

5.4 Accident and Access Profiles

The plotting of accident and access profiles is a method of analysis and has been previously emplolyed by the Ministry. It is a good method for visually presenting large amounts of data and determining relationships.

Profiles of the access point density (ranked in ascending order) versus distance were prepared for the following types of access density: commerical, public and commercial plus public. The corresponding profiles of accident rate versus distance were also prepared. The intent of this analysis was to determine which types of access densities affect the accident rate by observing whether the accident profile showed an increasing trend similar to the corresponding increasing access profile. The profiles are included in Appendix F. This appendix is not included here. It may be obtained separately from the Research and Development Branch.

Table 5.4 summarizes the trends evident from the profiles.

The accident rate profiles corresponding to the commercial plus public access density ranked in ascending order, showed an increasing trend for four-lane, high speed sections and two-lane, low speed sections. The accident rate profile for the public access densities showed the strongest trend.

Four-lane sections were combined and divided into the following volume ranges:

0 -	20,000 AADT
20,000 -	30,000 AADT
over	30,000 AADT

In general, the accident profiles for the different volume ranges showed a stronger increasing trend than the profiles for all volumes together.

TABLE 5.4

Summary of

Plots of Accident Rate versus Distance corresponding to commercial plus public, public or commercial access point density ranked in ascending order.

Graph No:	# lanes	Speed	Volume Range	Type of Access Point Density (in Ascending Order)	Visual Observation	R^2 (correlation of Access Point Density to Accident Rate)
2	4	high	all volumes	commercial plus public	increasing	0.26
4	4	high	all volumes	public	strong increasing	0.56
6	4	high	all volumes	commercial	no trend	0.00
8	4	low	all volumes	commercial plus public	no trend	0.06
10	4	low	all volumes	public	some increasing	0.14
12	4	low	all volumes	commercial	no trend	0.00
14	2	high	all volumes	commercial plus public	no trend	0.10
16	2	high	all volumes	public	some increasing	0.14
18	2	high	all volumes	commercial	no trend	0.02
20	2	low	all volumes	commercial plus public	increasing	0.36
22	2	low	all volumes	public	increasing	0.47
24	2	low	all volumes	commercial	increasing	0.21
26	4	all	all volumes	commercial plus public	increasing	0.17
28	4	all	all volumes	public	increasing	0.39
30	4	all	all volumes	commercial	no trend	0.03
32	4	all	0-20,000 AADT	commercial plus public	increasing	0.27
34	4	all	0-20,000 AADT	public	increasing	0.39
36	4	all	0-20,000 AADT	commercial	some increasing	0.14
38	4	all	20,000 - 30,000 AADT	commercial plus public	some increasing	0.13
40	4	all	20,000 - 30,000 AADT	public	increasing	0.36
42	4	all	20,000 - 30,000 AADT	commercial	no trend	0.01
44	4	all	over 30,000 AADT	commercial plus public	no trend	0.06
46	4	all	over 30,000 AADT	public	increasing	0.72
48	4	all	over 30,000 AADT	commercial	increasing	0.18
50	2	all	all volumes	commercial plus public	no trend	0.07
52	2	all	all volumes	public	no trend	0.04
54	2	all	all volumes	commercial	no trend	0.06

Two-lane sections were also considered. The accident rate profiles showed less of a trend than the profiles for the uncombined data, which was divided into high and low speeds.

The plots described above were also analyzed by a linear regression, with the access density as the independant variable and the accident rate as the dependent variable. For each of the graphs produced, the coefficient of multiple determination, R^2 was calculated. (See Table 5-4.) The results of the linear regression quantify the trends which were visually evident from the plots. Generally the R^2 values were low.

5.5 Access Spacing Vs. Accident Rate

The intent of this analysis was to further explore and quantify the relationship of access density with accident rate for the four-lane study section categories exhibiting the strongest relationships as identified in the preceeding analysis. Graphs of the accident rate versus the commercial plus public access density were plotted for four-lane study sections divided into volume ranges. These graphs are shown as Exhibits 5-1 to 5-4.

The relationship of access density with accident rate was also further explored for two-lane study sections. A graph of the accident rate versus the commercial plus public access density was plotted for two-lane sections. (See Exhibit 5-5.)

The two-lane sections were not divided into volume ranges because of the small difference between the highest and lowest volumes. The sections were not divided into high and low speeds because of the insufficient number of two-lane, low speed study sections.

Exhibits 5-1 to 5-3 for four-lane sections show the data points to follow an 'S' - shaped curve and to increase sharply between a density of 3 and 8 access points per km. Exhibit 5-4 shows the data points to follow a generally increasing trend; however, a sharp increase within a certain volume range is not evident. Exhibit 5-5 indicates that most of the two-lane highway sections examined have fewer than 8 access points per km, and shows no increasing trend between access density and the accident rate.

An equation of cubic form was applied to these data points and the plots were then analyzed using multiple regression. The resulting correlation coefficient, R^2, and the F-Ratio are shown in Table 5.5.

From Exhibit 5-1 (accident rate versus commercial plus public access points for four-lane study sections all volumes) three separate curves may be distinguished. These curves (referred to as the upper, middle and lower curves) were separately analyzed. (See Table 5.5.) The analysis reveals that the upper and lower curves have a good coefficient of multiple determination and are significant at the 5% level.

The analysis of low volume range (0-20,000 AADT) four-lane sections (Exhibit 5-2) reveals the data points to have a good coefficient and to be significant. The plots of four-lane sections with higher volumes (Exhibits 5-3 and 5-4) have much lower coefficients and are not significant.

For two-lane sections shown in Exhibit 5-5 there was a relatively low coefficient but the equation of the curve was significant.

TABLE 5.5

Summary of

Plots of Accident Rate versus Commercial plus

Public Access Density

Exhibit #	# lanes	Speed	Volume Range	R^2	Adj. R^2	F-Ratio	Significant @ 5% level	Constant	Cubic Equation Parameter Estimate CP	$(CP)^2$	$(CP)^3$
5-1	4	all	all	0.36	0.31	6.88	yes	0.399	0.581	-3.035×10^{-2}	4.560×10^{-4}
5-1 (upper curve)	4	all	all	0.71	0.65	13.62	yes	0.297	0.525	3.057×10^{-2}	-2.836×10^{-3}
5-1 (middle curve)	4	all	all	0.61	0.46	4.15	yes	0.425	-0.258	0.158	-9.192×10^{-3}
5-1 (lower curve)	4	all	all	0.86	0.75	8.04	yes	0.066	8.651×10^{-2}	1.578×10^{-2}	-5.923×10^{-4}
5-2	4	all	0-20,000 AADT	0.53	0.40	4.16	yes	0.306	0.549	-2.545×10^{-2}	3.129×10^{-4}
5-3	4	all	20,000-30,000 AADT	0.35	0.19	2.29	no	0.430	0.587	-2.780×10^{-2}	3.238×10^{-4}
5-4	4	all	over 30,000 AADT	0.11	0.00	0.20	no	-4.067	3.363	-0.541	2.874×10^{-2}
5-5	2	all	all	0.15	0.10	1.91	yes	0.906	4.032×10^{-2}	1.510×10^{-2}	-6.213×10^{-4}

* CP = No. of Commercial plus Public Access Points per km

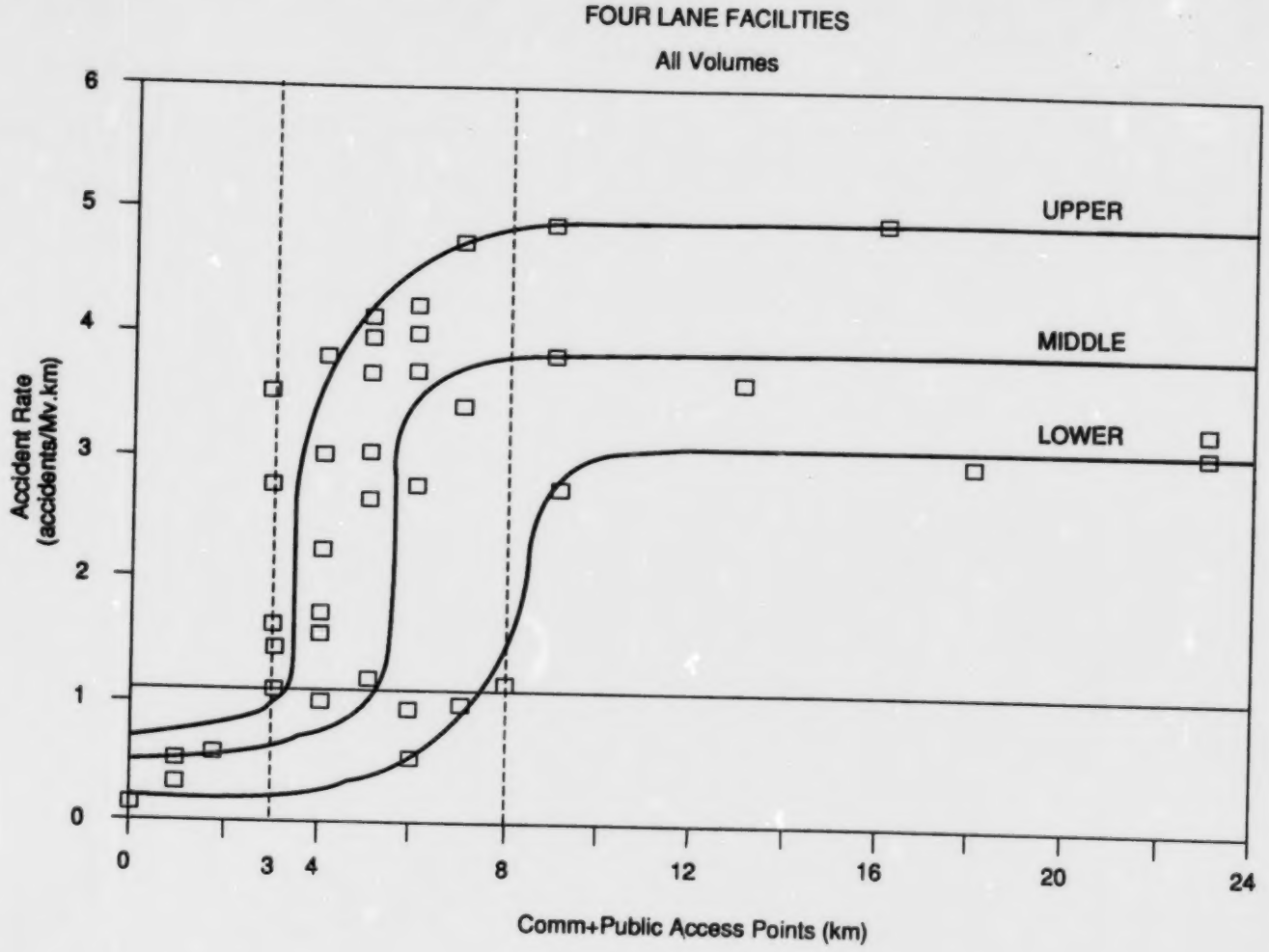
FOUR LANE FACILITIES
All Volumes
Accident Rate (accidents/Mv.km)
0
1
2
3
4
5
6
UPPER
MIDDLE
LOWER
0
3
4
8
12
16
20
24
Comm+Public Access Points (km)

EXHIBIT 5.1

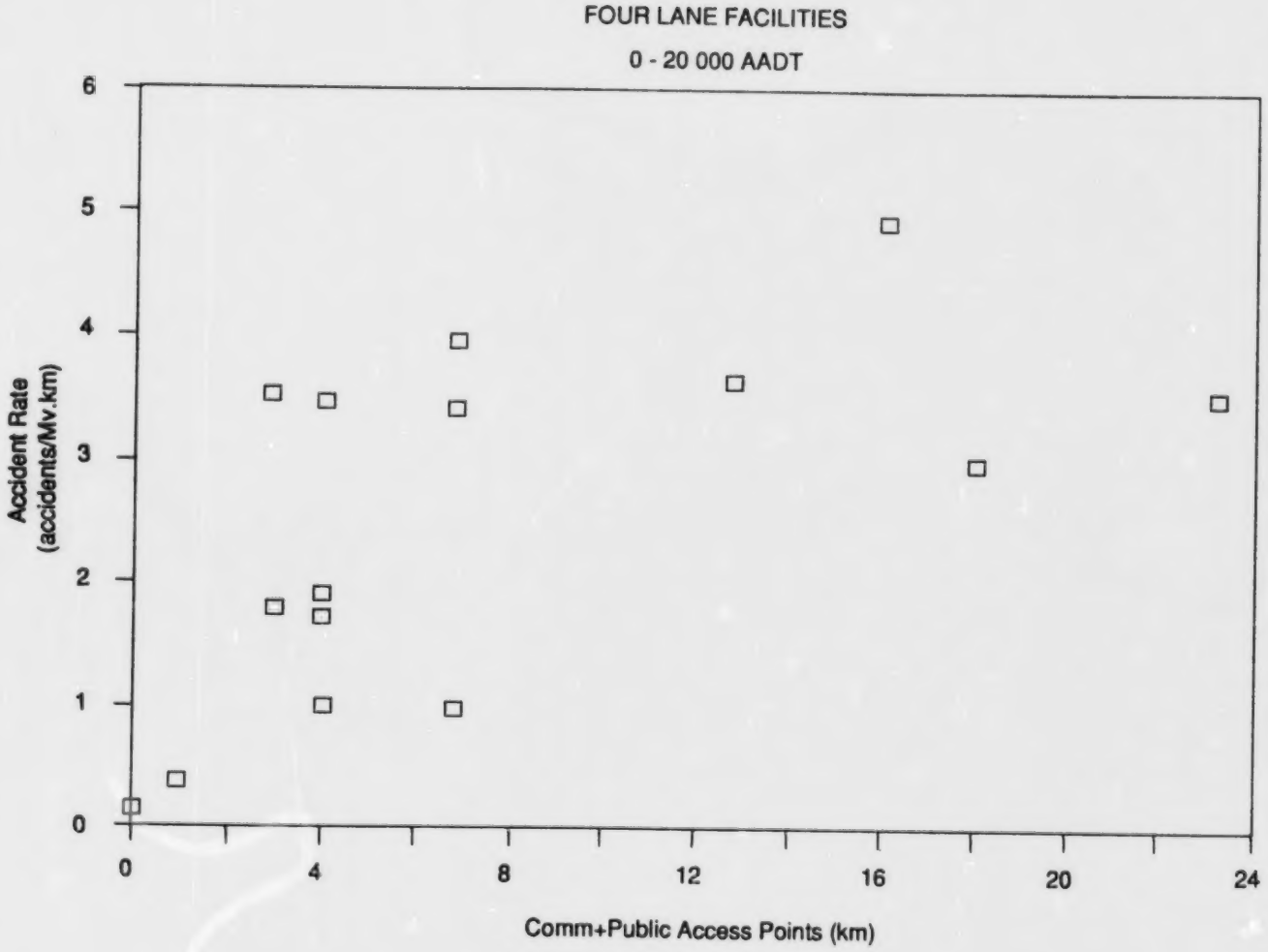
FOUR LANE FACILITIES
0 - 20 000 AADT
Accident Rate (accidents/Mv.km)
0
1
2
3
4
5
6
0
4
8
12
16
20
24
Comm+Public Access Points (km)

EXHIBIT 5.2

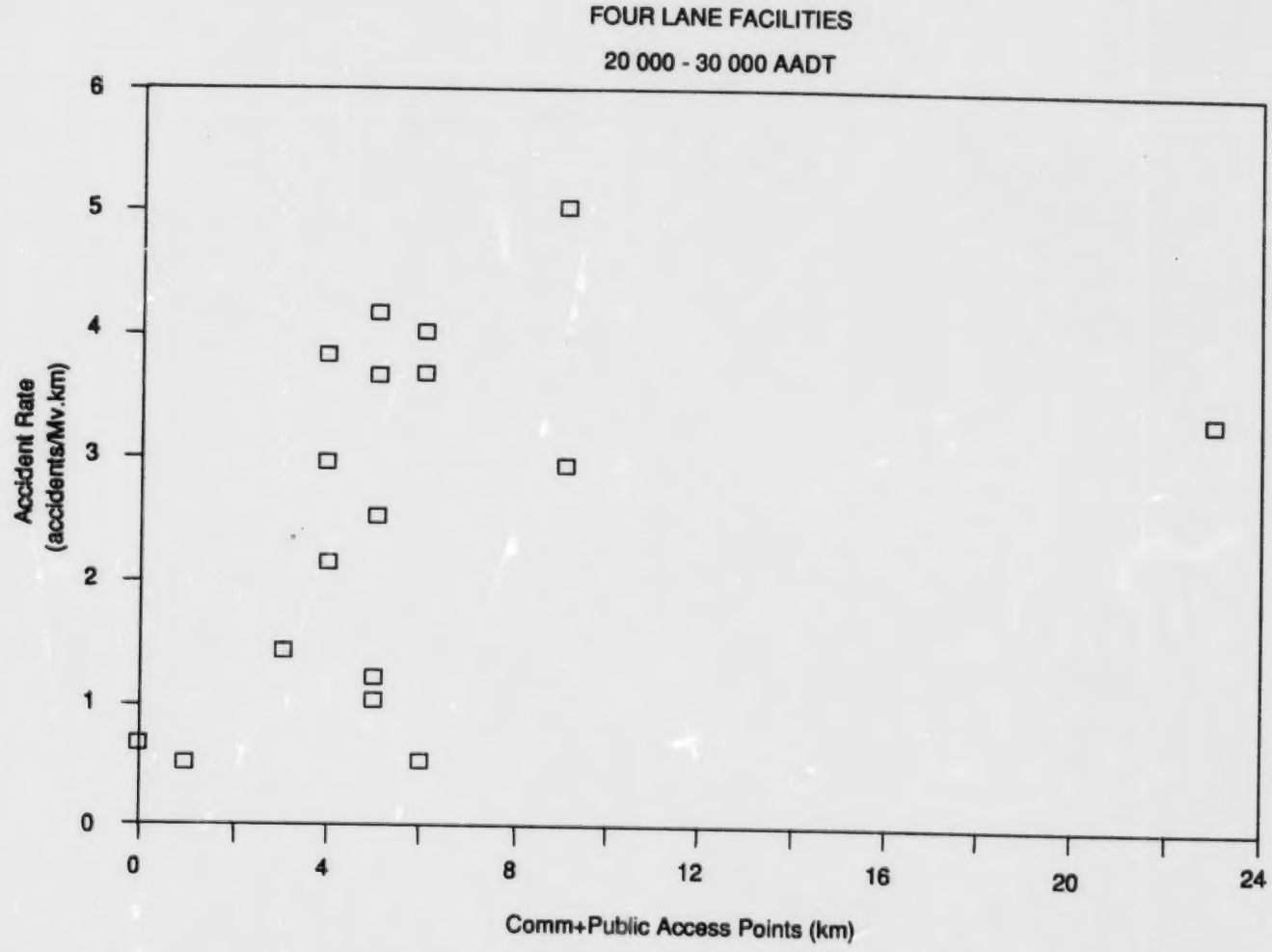
FOUR LANE FACILITIES
20 000 - 30 000 AADT
Accident Rate
(accidents/Mv.km)
0
1
2
3
4
5
6
0
4
8
12
16
20
24
Comm+Public Access Points (km)

EXHIBIT 5.3

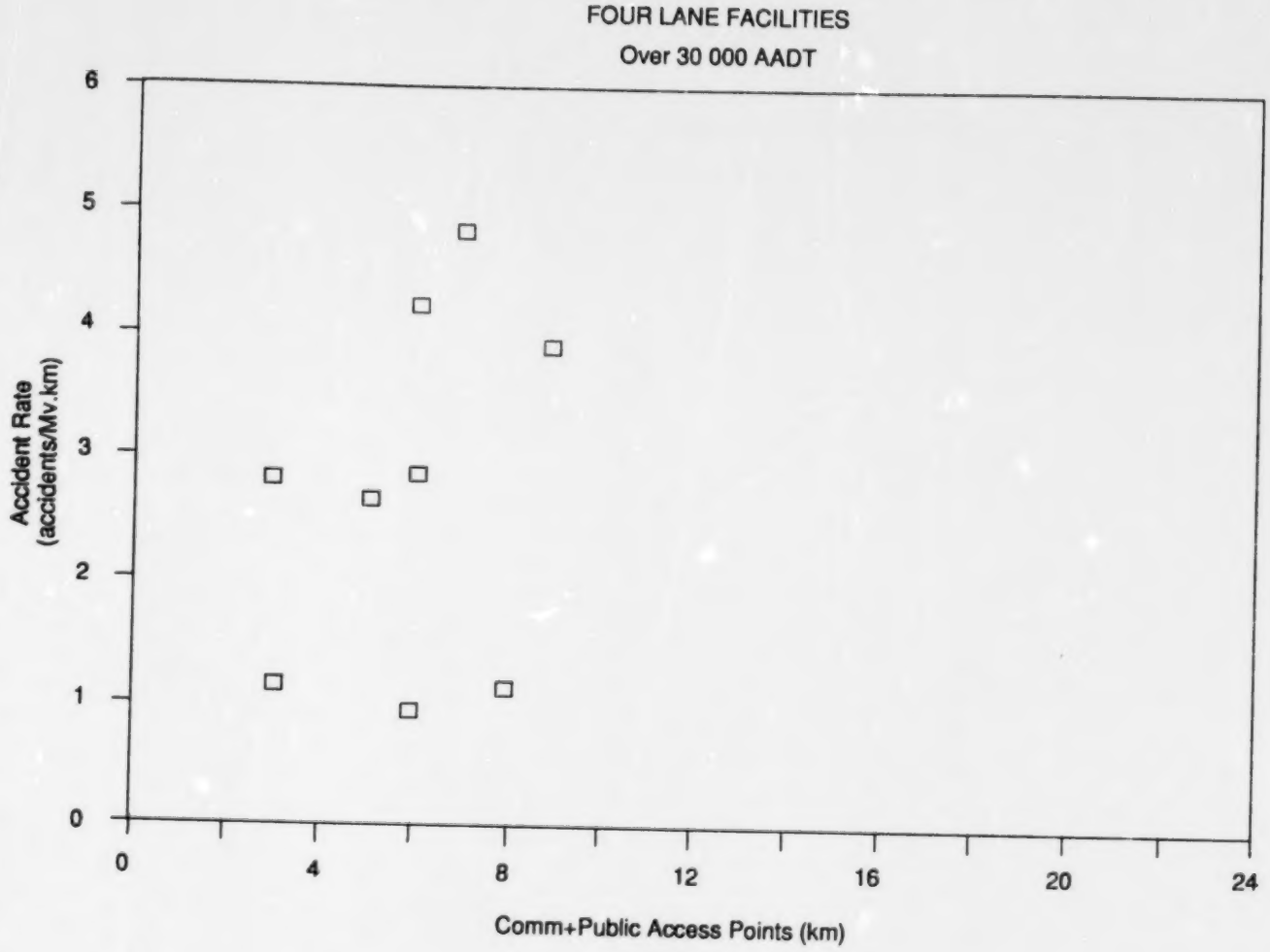
FOUR LANE FACILITIES
Over 30 000 AADT
Accident Rate
(accidents/Mv.km)
0
1
2
3
4
5
6
0
4
8
12
16
20
24
Comm+Public Access Points (km)

EXHIBIT 5.4

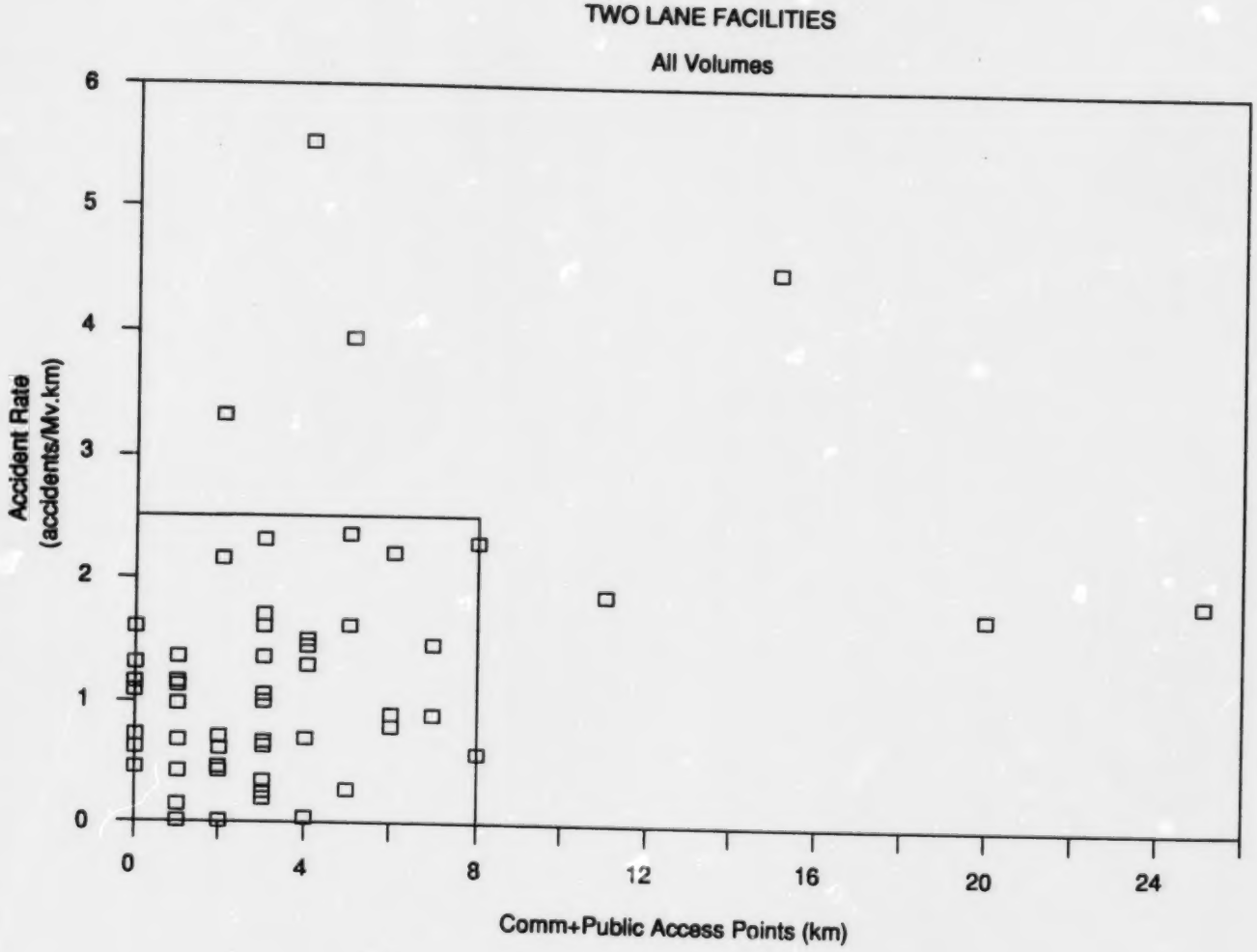
TWO LANE FACILITIES
All Volumes
Accident Rate (accidents/Mv.km)
0
1
2
3
4
5
6
0
4
8
12
16
20
24
Comm+Public Access Points (km)

EXHIBIT 5.5

6. MITIGATION

6.1 Additional Through Lanes

Table 6.1 shows the effect of widening a high volume two-lane roadway to a four-lane facility. High volume (4,000 - 7,000 AADT) two-lane sections were compared to low volume (5,000 - 15,000) four-lane sections with comparable commerical plus public access point densities.

In all cases, a reduction in the number of accidents was observed. However, the percentage reduction in accidents decreased as the access point density increases.

6.2 Two-Way Left Turn Lanes

The literature review (see Section 3) identified that two-way left turn lanes significantly reduce the number of accidents. Most articles indicated a 25 to 35% decrease in accidents from a four-lane to a five-lane section.

A comparison was undertaken of two similar roadway sections with four and five-lane cross-sections.

In the first example, two sections of Highway 7 with a posted speed of 80 km/h were compared. A four-lane section in the vicinity of Keele Street was compared to a five-lane section just east of Jane.

The five-lane section showed an accident rate of 1.59 and the four-lane section an accident rate of 4.75. This indicates that the installation of a two-way left turn lane decreased accidents by 66%.

TABLE 6.1

ADDITIONAL THROUGH LANES

Commercial Plus Public Access Points per km.	Accident Rate		% Reduction
	2 Lanes High Volume	4 Lanes Low Volume	
4	1.48	0.89	40%
8	2.08	1.57	25%
10	2.38	1.91	20%
12	2.68	2.25	16%
14	2.98	2.59	13%
16	3.28	2.93	11%
18	3.58	3.27	9%
20	3.88	3.61	7%
25	4.63	4.46	4%
30	5.38	5.31	1%

A comparison was also undertaken of a section of Highway 7 with a two-way left turn lane in the vicinity of McCowan Road and a section of Highway 7 in the vicinity of Martingrove Road without a two-way left turn lane. Both sections had a posted speed of 60 km/h . The section with a two-way left turn lane had an accident rate of 5.3 and the section without 6.3, indicating a reduction in accidents of 16%.

6.3 Turn Prohibitions and Left-Turn Lanes

Comparisons were undertaken before and after the installation of median barriers on a section of Highway 35.

On Highway 35 a median barrier was installed after 1975 between Highway 401 and Durham Road 17. A comparison between the 1975 and 1983 accident rate showed an overall decrease in accidents of 57%.

Left-turn deceleration lanes and then a median barrier were installed on Highway 11 from the Highway 400 extension to Simcoe Road 20 between 1974 and 1976. Comparing the average accident rate of 1971, 1972 and 1973 to the average accident rate of 1977, 1978 and 1979 reveals a total accident reduction of 60%.

7. GUIDELINES

7.1 Objective

This section summarizes the major findings of the study and provides guidelines to be used in the development of Ministry policies.

The guidelines were developed based on the overall objective that accident rates on all Provincial highways should not exceed the current Provincial average accident rate of 1.1 accidents per million vehicle kilometres.

7.2 Four Lane Facilities

Exhibit 5.1 shows a graph of the accident rate versus the combined commercial plus public access density for the four lane highway sections studied.

The accident rate objective is realized below a density of three commercial plus public access points per kilometre. In the range of three to eight access points/km, accident rates vary considerably and the objective can be realized or be greatly exceeded. Above eight access points/km the accident rate objective is always greatly exceeded.

Based on these findings and to meet the objective of the Provincial average accident rate, a highway should ideally have an access density of less than three access points per kilometre. With public road access every 400 m in accordance with usual Ministry applications,

there would be no additional private commercial entrances allowed.

Between three and eight access points per kilometre the highway is approaching a density where the accident objective can be greatly exceeded and remedial measures may be required.

Above eight access points per kilometre, the accident rate will greatly exceed the objective and experience an accident rate of three to four times the Provincial average.

To reduce the accident rate, remedial measures must be employed. Research has indicated that the expected accident reduction is as follows:

Additional through lanes	up to 40%
Two-way left turn lanes	25% - 35%
Left turn deceleration and storage lanes	50%
Turn prohibitions through the installation of raised centre median barriers	57%

7.3 Two Lane Facilities

Exhibit 5.5 shows a graph of the accident rate versus the commercial plus public access density for the two-lane highway sections studied.

In general, the accident rate was evenly distributed ranging from zero to 2.5. There was no apparent increasing trend evident from the graph. It was concluded that the accident rate for two lane highways must be related to other external factors.

In urbanizing areas where it is likely that a two lane highway will be widened to a four lane highway (which generally occurs for two-lane highways with an AADT greater than 5,000 AADT) the four lane criteria as outlined above should be applied.

For two lane highways with an AADT less than 5,000 vehicles, the Ministry can apply the current policy as there is not evidence to support any modifications.

7.4 Residential Access Density

The analysis undertaken for this study identified that the residential access density does not contribute to the accident rate. However, other adverse effects may result if a very high residential access density exists.

Historically, in areas of urban development, residential units have been converted to commercial uses. If a significant number of residential units are converted, the accident rate could increase dramatically. In urbanizing fringe areas where the likelihood of conversion is high, the Ministry may wish to consider residential entrances as commercial entrances when applying their policies.

APPENDIX A

LITERATURE SUMMARY

Access Management for Streets and Highways ... FHWA-IP-82-3 ... Federal Highway Administration, U.S. Department of Transportation ... June 1982

Approach

A literature review of access control studies was conducted and various techniques for reducing the frequency and severity of traffic conflicts at driveways were evaluated.

Findings

In 39 American States, the current policy is to require a minimum spacing of 25 feet between driveways on rural roadways and a minimum spacing of 10 to 25 feet on urban roadways.

The Wisconsin State Highway Plan requires a minimum spacing between driveways which is based on the traffic volume of the roadway. For suburban roadways the minimum spacing is 300 feet (500 feet for high volume arterials of 20,000 to 30,000 vehicles/day), and for rural roadways the minimum spacing varies from 300 to 1,000 feet depending on the daily volume. The minimum spacing between driveways in Pennsylvania is based primarily on the volume of the driveway.

The following table presents the anticipated percentage reduction in total annual accidents of several conflict control techniques.

Technique	% Reduction in Annual Accidents
Two-way left-turn lane	35
Alternating left-turn lane	28
Left-turn deceleration lane	50
Prevent parking	15
Driveway width control	40 (per driveway)

It was found that 45% of all driveway related accidents involved a left-turn enter manoeuvre, 27% involved a left-turn exit manoeuvre and right-turn enter and exit manoeuvres each accounted for 15% of driveway related accidents.

Synthesis of Safety Research Related to Traffic Control and Roadway Elements - Vol. 1 ... FHWA-TS-82-232 ... Federal Highway Administration, U.S. Department of Transportation ... December 1982

Approach

A literature review of the relationship between access control and accident experience was conducted.

Findings

Several studies found that accident frequency increases as the traffic volume on a roadway increases. Accidents were also found to be directly related to the physical features of the highway, and the number of access points proved to be a good prediction of the number of potential accidents. One study established the following relationship between intersections and businesses per mile, and the accident rate.

Intersections/mile	Businesses/mile	Accident Rate (mil. vehicle mile)
0.2	1	1.26
2	10	2.70
20	100	17.18

Another study reported the following accident rates for artérial highways.

Annual Accidents Per Mile

	Highway ADT (veh./day)		
Level of Development	Low	Medium	High
(Driveways/mile)	<5,000	5,000-15,000	>15,000
Low <30	12.6	25.1	37.9
Medium 30-60	20.2	39.7	59.8
High >60	27.7	54.4	81.7

Each commercial driveway on an arterial street was found to add between 0.1 and 0.5 accidents/mile/year.

A table of access point spacing based on the speed and the average acceleration rate of the roadway traffic was established by assuming that access point spacing should be greater than 1.5 times the distance needed for an entering vehicle to accelerate to the speed of the through traffic stream.

Access Point Spacing (feet)

	Speed (m.p.h.)			
Average Acceleration (fps^2)	30	35	40	45
2	735	990	1300	1630
3	490	660	860	1100
4	360	500	660	825

The following table presents the minimum spacing of driveways and access points necessary to alleviate overlapping right-turn conflict areas on urban arterials.

Arterial Speed (m.p.h.)	Minimum Spacing (feet)
30	125
35	150
40	185
45	230

Mitigation Techniques

Several techniques for reducing conflicts at commercial driveways were evaluated, and Exhibit 1 shows the estimated annual accident reduction of each technique.

Problems Encountered

Most of the studies reported problems of obtaining consistent and meaningful accident data. These were attributed to difficulty in identifying causal factors and in assigning collision locations, incompleteness of reporting and the probable high proportion of unreported accidents.

Evaluation of Driveway - Related Accidents in Texas ... Operational Effects of Geometrics and Improvement Evaluations ... Transportation Research Record # 819

Approach

A study was conducted of driveway related accidents on city streets and county roads in Texas between 1975 and 1977.

Findings

Driveway related accidents accounted for 16% of the total number of roadway accidents. 93% of driveway related accidents occured in urban areas and 2/3 of driveway related accidents involved a vehicle exiting a driveway. Almost 72% of all fatal accidents involved a truck or motorcycle.

The study concluded that better design and operation of driveways could reduce the number of driveway related accidents.

Evaluation of Factors Influencing Driveway Accidents ... Transportation Research Record # 601

Approach

One hundred sections of urban arterial highway (totalling 96.85 km) in Indiana were studied in order to relate the driveway accident rate to the average spacing between adjacent driveways and between a driveway and the adjacent intersection. As well, driveway accident rates were related to the character of the roadway, the abutting environment and traffic characteristics.

Findings

The driveway spacing analysis derived the following two equations:

$$Y = 7.728 - 0.055\ X_1$$

$$Y = 11.584 - 0.068\ X_2$$

where Y is the number of driveway accidents per mile per year, X_1 is the average spacing (feet) between driveways and X_2 is the average spacing (feet) between the driveway and the intersection.

Regression equations were also derived relating the driveway accident rate to significant roadway and environmental characteristics. The most significant variable proved to be the number of commercial driveways per kilometer. Other important variables were the number of through traffic lanes, the arterial highway ADT, and the total number of intersections per kilometer. The number of residential driveways per kilometer was found to be in no way related to the accident rate.

Problems Encountered

The regression equations were used to predict the driveway accident rate for a past year. Extreme variance was found between the actual and predicted driveway accident rates. This was explained by noting that the models, developed on the basis of an average three year accident history, were used to predict a one year accident history.

Predicting Traffic Accidents from Roadway Elements on Urban Extensions of State Highways ... Highway Research Board Bulletin #208

Approach

The average traffic and accident values for 426 urban sections of highways for the years 1954 and 1955 were analyzed. Equations were developed which could be used to predict accidents on the urban extensions of the State Highway System.

Findings

The most important roadway element in predicting accidents was the number of commercial units. The second most

important element was the number of traffic signals. The number of residential driveways had a very low correlation with accident rates. Accident rate predictions were better for four-lane highways than for two-lane highways and for sections with higher ADT values. On low volume roads, the accident rate was not related to any roadway feature.

Predicting Traffic Accidents from Roadway Elements of Rural Two-lane Highways with Gravel Shoulders ... Highway Research Board Bulletin # 158

Approach

One mile sections totalling 1,400 miles of two-lane highways in Oregon were studied. Multiple correlation techniques were used to develop equations to predict accidents on rural two-lane highways from roadway elements.

Findings

Accidents rates were found to increase when vehicle volumes increased, when the number of access points increased, when the sight distance became impaired and when the cross-section was reduced.

The number of access points was a good predictor of accidents within an ADT group.

For highways with a "long-haul" function, the accident rate was closely related to the roadway access features such as intersections and driveways. For local service highways, accidents were closely related to the design features of the road.

Access Control on Arterial Highways ... Transportation Engineering Journal of ASCE ... Volume 12 No. TE1 ... February 1976

Approach

Several mitigating techiques to control conflicts at commercial driveways were identified, and warrants for the application of these techniques were also developed.

Findings

Mitigating techniques were divided into three groups according to which one of the three objectives they met:

1. Limit number of conflict points;
2. Limit maximum deceleration requirements;
3. Remove turning vehicles or queues from sections of through lanes.

Speed differentials of less than 10 m.p.h. are needed between the through speed and the driveway speed to minimize rear end collisions.

Geometric Design Element Groups and High-Volume Two-lane Rural Highway Safety ... Transportation Research Record # 960, 1984

Approach

The relationship among several geometric design elements and accidents on two-lane rural roads were studied. Only road

sections with volumes greater than 2,000 vehicles per day were used. Advanced multivariate techniques were used to develop models.

Findings

Traffic volume was the most important single factor in the frequency of accidents for 2-lane rural roads with ADT values between 2,000 and 13,000 vehicles/day. The second most important factor was the access point and intersection frequency.

Problems Encountered

There were problems in establishing how each highway descriptive variable affected the accident rate, because the variables are usually correlated.

Guidelines for Driveway Design and Location ... Institute of Transportation Engineers, 1985

Findings

This study concluded that the number of either commercial or residential driveways was a relatively unimportant factor in predicting accident rates, while the number of commercial units was a much greater factor.

Guidelines for Medial and Marginal Access Control on Major Roadways ... National Cooperative Highway Research Program Report 93

Findings

There was no significant difference in accident rates for road sections having no access points and those having access

points serving residential purposes. The accident rates for sections having commercial development were 2 to 3 times the rate for sections with no commercial development.

The number of driveway-related accidents increase when the volume of the driveway increases. The design and number of access points, not the traffic volume, poses the greatest threat to the capacity and safety of the roadway.

Multilane Design Alternatives for Improving Suburban Highways ... National Cooperative Highway Research Program Report 282

Approach

Combined findings from literature and data analysis of 469 miles of California and Michigan highways were used to determine the relative merits of different types of suburban multilane highways.

Findings

The study found the following factors to be statistically significant for predicting accident rates:

- truck percentage;
- type of roadside developement;
- shoulder width;
- driveways per mile;
- unsignalized intersections per mile.

Factors which were found to be not statistically significant included ADT, lane width and the estimated left-turn demand.

Suburban highways with residential roadside development have lower accident rates than suburban highways with commercial development. A full shoulder on suburban highways decreases the accident rate by 10%.

Effects of Paved Shoulders on Accident Rates for Rural Texas Highways ... Transportation Research Record # 819

Approach

A comparison was completed of accident rates and roadway characteristics for three different types of rural Texas highway.

Type I : two-lane without paved shoulders;
Type II : two-lane with paved shoulders;
Type III : four-lane undivided without paved shoulders.

Findings

The accident rate for each road type increased as the traffic volume increased. The two-lane roads with paved shoulders had the lowest accident rates for volumes ranging from 1000 to 7000 vehicles per day. The accident rates for the four-lane roads without paved shoulders were the least sensitive to traffic volume changes.

Regulation of Driveway Access to Arterial Streets ... Public Works ... Volume 109, October 1978

A Chicago Study found that 11% of all accidents on major streets involved driveway manoeuvers. The study recommended the following minimum spacings between two-way driveways.

Speed (m.p.h.)	Minimum Separation (feet)
20	85
25	105
30	125
35	150
40	185
45	230

TABLE 12 - Estimated Annual Accident Reduction (Per Mile) by Installing Raised Median Divider with Left Turn Deceleration Lanes

LEVEL OF DEVELOPMENT (Driveways per Mile)		HIGHWAY ADT (Vehicles per Day) LOW <5,000	MEDIUM 5-15,000	HIGH >15,000
LOW	<30	2.2	4.1	6.3
MEDIUM	30-60	5.8	11.2	17.2
HIGH	>60	10.7	20.7	31.2

TABLE 13 - Estimated Annual Accident Reduction (Per Driveway) by Signalizing (Two-Phase) Commercial Driveways (Three-Way)

DRIVEWAY ADT (Vehicles per Day)		HIGHWAY ADT (Vehicles per Day) LOW <5,000	MEDIUM 5-15,000	HIGH >15,000
LOW	<500	0.12	0.20	0.28
MEDIUM	500 - 1500	0.28	0.49	0.67
HIGH	>1500	0.43	0.76	1.02

TABLE 14 - Estimated Annual Reduction (per Driveway) by Signalizing (Three-Phase) Commercial Driveways (Three-Way)

DRIVEWAY ADT (Vehicles per Day)		HIGHWAY ADT (Vehicles per Day) LOW <5,000	MEDIUM 5-15,000	HIGH >15,000
LOW	<500	0.17	0.30	0.42
MEDIUM	500 - 1500	0.42	0.74	1.00
HIGH	>1500	0.65	0.14	1.53

TABLE 15 - Estimated Annual Accident Reduction (per Mile) by Installing:

Two-Way Left Turn Lane

or

Continuous Left Turn Lanes (for Each Direction of Traffic)

LEVEL OF DEVELOPMENT (Driveways per Mile)		HIGHWAY ADT (Vehicles per Day) LOW <5,000	MEDIUM 5-15,000	HIGH >15,000
LOW	<30	4.4	8.8	13.3
MEDIUM	30-60	7.1	13.9	20.9
HIGH	>60	9.7	19.0	28.6

TABLE 16 - Estimated Annual Accident Reduction (per Mile) by Installing Alternating Left Turn Lane

LEVEL OF DEVELOPMENT (Driveways per Mile)		HIGHWAY ADT (Vehicles per Day) LOW <5,000	MEDIUM 5-15,000	HIGH >15,000
LOW	<30	1.7	3.2	5.1
MEDIUM	30-60	3.5	7.1	11.6
HIGH	>60	6.4	13.3	21.0

TABLE 17 - Estimated Annual Accident Reduction (per Driveway) by Installing a Left Turn Deceleration Lane (in Median) in Lieu of a Right-Angle Crossover

DRIVEWAY ADT (Vehicles per Day)		HIGHWAY ADT (Vehicles per Day) LOW <5,000	MEDIUM 5-15,000	HIGH >15,000
LOW	<500	-	-	1.2
MEDIUM	500-150	1.3	2.2	3.0
HIGH	>1500	1.9	3.4	4.5

EXHIBIT 1

TABLE 18 - Estimated Annual Accident Reduction (per Driveway) by Offsetting Opposing Driveways

DRIVEWAY ADT (Vehicles per Day)		HIGHWAY ADT (Vehicles per Day)		
		LOW <5,000	MEDIUM 5-15,000	HIGH >15,000
LOW	<500	0.4	0.7	1.0
MEDIUM	500-1500	0.9	1.7	2.3
HIGH	>1500	1.6	2.6	3.6

TABLE 19 - Estimated Annual Accident Reduction (per Driveway) by Installing:

Right Turn Acceleration Lane (Exiting Driveway)

or

Right Turn Deceleration Lane (Entering Driveway)

DRIVEWAY ADT (Vehicles per Day)		HIGHWAY ADT (Vehicles per Day)		
		LOW <5,000	MEDIUM 5-15,000	HIGH >15,000
LOW	<500	0.02	0.03	0.05
MEDIUM	500-1500	0.05	0.08	0.11
HIGH	>1500	0.07	0.13	0.17

EXHIBIT 1

APPENDIX B

REPRESENTATIVE SECTIONS

RELATIONSHIP OF PRIVATE ENTRANCES TO HIGHWAY EFFICIENCY

FILE NO: 1101-01
DATE: FEB 26, 1987

CATEGORY I: HIGH VOLUME, HIGH SPEED, FOUR PLUS LANE FACILITIES

HWY	SECTION	LENGTH (km)	1984 AADT	POSTED SPEED (km/h)	ACTUAL SPEED (km/h)	No OF LANES	No OF ACCESS POINTS COMM	PUBLIC	RES	ACCESS POINT DENSITY (/km) COMM	PUBLIC	RES	No OF ACCIDENTS TOTAL	D.R.	ACCIDENT RATE TOTAL	D.R.	LEVEL OF SERVICE	ROADSIDE ENVIRONMENT	PEAKING PATTERN
7	AIRPORT RD TO 2.3 km E	2.3	28000	80	100	4	5	3	0	2.177	1.304	0	28.67	3.5	1.22	0.15	D	RURAL	SUB CNTR
7	2.3 km E TO 3.3 km E	1.0	28000	80	100	4	0	2	0	0	2	0	6.33	0	0.62	0	D	RURAL	SUB CNTR
7	3.3 km E TO HWY 50	1.7	28000	80	100	4	6	3	3	3.529	1.764	1.764	32	1.33	1.84	0.08	D	MIXED	SUB CNTR
7	HWY 50 TO HWY 27	2.3	26800	80	100	4	2	4	1	0.869	1.739	0.434	31.92	4	1.42	0.18	D	RURAL	SUB CNTR
7	PINE VALLEY DR TO 2.3 km	2.3	26800	80	100	4	5	4	7	2.173	1.739	3.043	43.33	24.67	1.93	1.1	D	RESID	SUB CNTR
7	2.3 km E TO JANE ST	1.7	31800	80	100	4	0	6	2	0	3.529	1.176	40.83	4.67	2.07	0.24	E	RURAL	SUB CNTR
7	JANE ST TO 1.2 km E JANE	1.2	33800	80	100	5	8	5	4	6.666	4.166	3.333	31	7.67	2.09	0.52	E	MIXED	SUB CNTR
7	1.2 km E JANE TO BUFFERIN	3.0	26900	80	100	4	9	7	18	3	2.333	6	94	18.67	3.19	0.63	C	MIXED	SUB CNTR
5	GUELPH LINE TO EVANS RD	4.0	10000	80	97	4	7	8	42	1.75	2	10.5	18.5	2	1.27	0.14	C	RESID	CNT-TR-REC
27	REXDALE BLVD TO HWY 50	3.2	32500	80	100	4	11	8	0	3.437	2.5	0	99.83	1.67	2.63	0.04	D	MIXED	URB CNTR
27	HWY 50 TO HWY 7	3.4	16500	80	100	4	8	7	4	2.352	2.058	1.176	49.58	5.33	2.42	0.26	D	MIXED	URB CNTR
11	S KASHE LK RD TO 4.8 km N	4.8	12400	80	100	4	11	10	33	2.291	2.083	6.875	21.33	2	0.98	0.09	E	RESID	LOW REC
11	4.8 km N TO N JCT HWY 169	3.2	12400	80	100	4	22	3	13	6.875	0.937	4.062	12.17	2.67	0.84	0.18	E	COMM	LOW REC
6	0.8 km N of HWY 5 TO HILLGROVE RD	3.1	14900	80	97	4	5	4	36	1.612	1.290	11.61	15.17	3.83	0.9	0.23	C	RESID	COMMUTER

CATEGORY 2: HIGH VOLUME, LOW SPEED, FOUR PLUS LANE FACILITIES

HWY	SECTION	LENGTH (km)	1984 AADT	POSTED SPEED (km/h)	ACTUAL SPEED (km/h)	No OF LANES	No OF ACCESS POINTS			ACCESS POINT DENSITY (/km)			No OF ACCIDENTS		ACCIDENT RATE		LEVEL OF SERVICE	ROADSIDE ENVIRONMENT	PEAKING PATTERN
							COMM	PUBLIC	RES	COMM	PUBLIC	RES	TOTAL	D.R.	TOTAL	D.R.			
7	HWY 410 TO 3.9 km N	3.9	32500	60	80	4	13	12	4	3.33	3.08	1.03	103.33	7.33	2.23	0.16	D	COMM	URB CNTR
7	McCOWAN RD TO HWY 48	1.9	24800	50	65	5	20	13	9	10.53	6.84	4.74	64.33	14.67	3.74	0.85	D	MIXED	URB CNTR
7	HWY 27 TO 135 e east of MARTINGROVE	1.2	29300	60	75	4	14	3	0	11.67	2.5	0	20.25	6.33	1.58	0.49	C	COMM	SUB CNTR
7	135 e east of MARTINGROVE TO 110 e east of KIPLING	1.0	29300	60	75	4	6	3	7	6	3	7	17.67	7.33	1.65	0.69	C	MIXED	COMMUTER
11	STEELES AVE TO CENTRE ST	2.2	26500	50	60	4	24	17	3	10.91	7.73	1.36	111	21.67	5.22	1.02	D	COMM	URB CNTR
11	CENTRE ST TO HWY 7	2.0	23400	50	75	4	29	11	4	14.5	5.5	2	52.33	8.83	3.06	0.52	D	COMM	URB CNTR
11	HWY 7 TO CARRVILLE RD	2.1	23000	60	80	4	22	10	3	10.48	4.76	1.43	40	4.33	2.27	0.25	D	COMM	URB CNTR
11	CARRVILLE TO MAJ MCKENZIE	4.2	23000	60	80	4	19	12	10	4.52	2.86	2.38	55	13.83	1.56	0.39	D	COMM	URB CNTR
31	LEITRIM TO 2.7 km N	2.7	8500	60		4	5	8	23	1.85	2.96	8.52	8.33	1.33	0.99	0.16	C	RESID	COMMUTER
31	2.7 km N TO 3.4 km N	0.7	12000	60		4	8	8	11	11.43	11.43	15.71	15	0.33	4.89	0.11	C	RESID	SUB CNTR
2	1650 e E BROCK RD TO 300 e E CHURCH	0.9	16800	60	80	4	11	7	23	12.22	7.78	25.56	16.67	1.67	3.02	0.3	D	MIXED	SUB CNTR
18	TURKEY CREEK BRIDGE (LASALLE) TO GARY AVE	2.0	8800	60		4	16	23	45	8	11.5	22.5	16.17	3.67	2.52	0.57	D	MIXED	INTER CNTR
101	FROM TIMMINS W LTS WESTERLY 2.7 km	2.7	18000	50		4	23	18	58	8.518	6.666	21.48	64.67	15.83	3.65	0.89	D	MIXED	INTER CNTR

CATEGORY 3: HIGH VOLUME, HIGH SPEED, TWO LANE FACILITIES

HWY	SECTION	LENGTH (km)	1984 AADT	POSTED SPEED (km/h)	ACTUAL SPEED (km/h)	No OF LANES	No OF ACCESS POINTS COMM	No OF ACCESS POINTS PUBLIC	No OF ACCESS POINTS RES	ACCESS POINT DENSITY (/km) COMM	ACCESS POINT DENSITY (/km) PUBLIC	ACCESS POINT DENSITY (/km) RES	No OF ACCIDENTS TOTAL	No OF ACCIDENTS D.R.	ACCIDENT RATE TOTAL	ACCIDENT RATE D.R.	LEVEL OF SERVICE	ROADSIDE ENVIRONMENT	PEAKING PATTERN
18	AMHERSTBURG N LTS TO 4.7 km N OF LTS	4.7	6250	70	80	2	6	8	160	1.28	1.7	34.04	11	4.33	1.03	0.4	C	RESID	COMMUTER
18	4.7 km N OF LTS TO 6.5 km N OF LTS	1.8	6250	80	80	2	3	1	10	1.67	0.56	5.56	4.33	0	1.05	0	C	RESID	COMMUTER
18	6.5 km N OF LTS TO MALDEN RD	1.9	6250	80	80	2	0	1	53	0	0.53	27.89	5.33	0.67	1.23	0.15	C	RESID	COMMUTER
18	MALDEN RD TO MARTIN LANE	2.7	6250	70	80	2	4	4	109	1.48	1.48	40.37	13.17	4.17	2.14	0.68	C	RESID	COMMUTER
18	MARTIN LANE TO GARY AVE	1.8	6250	70	80	2	5	7	74	2.78	3.89	41.11	10.67	2	2.6	0.49	C	RESID	COMMUTER
69	0.5 km N HWY 141 TO BLOCK	4.6	6600	90	105	2	0	11	16	0	2.39	3.48	20.5	0.33	1.85	0.03	E	RURAL	INTER TOUR
69	BLOCK RD TO GRAVEL RD	6.3	6600	90	105	2	1	5	24	0.16	0.79	3.81	24	1	1.58	0.07	E	RURAL	INTER TOUR
69	GRAVEL RD TO RICHMOND LK	5.3	7850	80	105	2	8	7	22	1.51	1.32	4.15	20.67	3	1.36	0.2	E	MIXED	INTER TOUR
6	0.3 km SW OF N JCT RD 69 TO 1.1 km NE OF CON RD 9	3.2	4000	80	95	2	1	6	19	0.31	1.88	5.94	4.33	0.67	0.93	0.14	C	RURAL	INTER CNTR
6	1.1 km NE OF CON RD 9 TO 0.3 km SW OF ARMY CAMP RD	2.5	4060	80	95	2	1	2	23	0.4	0.8	9.2	1.33	0	0.36	0	C	RESID	INTER CNTR
6	0.3 km SW OF ARMY CAMP RD TO NORFOLK RD 9	2.3	5550	80	95	2	6	5	6	2.61	2.17	2.61	2.83	0.33	0.61	0.07	C	MIXED	INTER CNTR
26	HWY 92 TO COLLING. S LTS	4.3	8500	80	95	2	21	49	52	3.33	7.78	8.25	40.33	7.5	2.47	0.38	D	RESID	LOW TOURIS
31	LEITRIM TO 1.1 km S	1.1	7100	80	113	2	11	2	16	10	1.82	14.55	5	2	1.75	0.7	C	COMM	INTER CNTR
31	1.1 km S TO 6.6 km S	5.5	6950	80	113	2	38	9	75	6.91	1.64	13.64	22.67	6.33	1.62	0.45	C	MIXED	INTER CNTR
31	6.6 km S TO OTT/CARL RD 8	8.1	5300	80	95	2	11	12	104	1.36	1.48	12.84	21.5	4	1.37	0.26	C	RESID	INTER CNTR
27	HWY 7 TO RUTHERFORD RD	4.3	8300	80	100	2	5	6	20	1.16	1.4	4.65	15.17	2.33	1.16	0.18	D	RESID	COMMUTER
27	RUTHERFORD RD TO KIRBY RD	6.4	8200	80	100	2	6	17	35	0.94	2.66	5.47	20.67	2.67	1.08	0.14	D	RESID	COMMUTER
27	KIRBY TO VAUGHAN-KING BDY	2.0	8100	80	100	2	0	4	15	0	2	7.5	7.17	0	1.21	0	D	RESID	COMMUTER
6	FLAM-PUSLINCH BDY RD TO 10.1 km N OF LESLIE RD	1.8	10200	80	97	2	3	6	20	1.67	3.33	11.11	7	0.83	1.04	0.12	E	RESID	COMMUTER
6	10.1 km N OF LESLIE RD TO E JCT HWY 401	2.9	10600	80	97	2	1	7	31	0.34	2.41	10.69	19.83	2.83	1.77	0.25	E	RESID	COMMUTER
33	PRINCE ED RD 3 TO TRENTON S LTS	5.2	5350	80	95	2	7	12	36	1.35	2.31	6.92	17.17	4.33	1.69	0.43	C	RESID	COMM-REC
29	LEEDS & GRENVILLE RD 7 NORTHERLY 4.5 km	4.5	4300	80	113	2	4	6	22	0.89	1.33	4.89	5.17	0	0.73	0	C	RURAL	COMMUTER

CATEGORY 3 (continued): HIGH VOLUME, HIGH SPEED, TWO LANE FACILITIES

HWY	SECTION	LENGTH (km)	1984 AADT	POSTED SPEED (km/h)	ACTUAL SPEED (km/h)	No OF LANES	No OF ACCESS POINTS			ACCESS POINT DENSITY (/km)			No OF ACCIDENTS		ACCIDENT RATE		LEVEL OF SERVICE	ROADSIDE ENVIRONMENT	PEAKING PATTERN
							COMM	PUBLIC	RES	COMM	PUBLIC	RES	TOTAL	D.R.	TOTAL	D.R.			
17	1.22 km N CENTENNIAL CRES TO CENTENNIAL CRES	1.2	4000	90	97	3	3	3	1	2.5	2.5	0.83	1.33	0	0.76	0	C	RURAL	INTER TOUR
17	CENT CRES TO 4.3 km E	4.3	4000	90	97	3	1	3	13	0.23	0.7	3.02	5.67	1	0.9	0.16	C	RURAL	INTER TOUR
101	FROM 2.7 km W of LTS WESTERLY 3.9 km	3.9	4350	80	90	4	8	10	10	2.051	2.564	2.564	9.33	1.33	1.51	0.21	C	RESID	INTER CNTR

CATEGORY 4: HIGH VOLUME, LOW SPEED, TWO LANE FACILITIES

HWY	SECTION	LENGTH (km)	1984 AADT	POSTED SPEED (km/h)	ACTUAL SPEED (km/h)	No OF LANES	No OF ACCESS POINTS			ACCESS POINT DENSITY (/km)			No OF ACCIDENTS		ACCIDENT RATE		LEVEL OF SERVICE	ROADSIDE ENVIRONMENT	PEAKING PATTERN
							COMM	PUBLIC	RES	COMM	PUBLIC	RES	TOTAL	D.R.	TOTAL	D.R.			
5	.745 m E OF MILL RD TO .990 m W OF MILL RD (WATERDOWN)	1.8	10150	50/60		2	17	15	30	9.44	8.33	16.67	8.33	3.67	1.25	0.55	D	MIXED	COMMUTER
7	.2 km east of REG BORY TO 1.6 km east of BORY (GREEN RIVER)	1.4	4050	60		2	4	3	23	2.86	2.14	16.43	1.67	0.67	0.81	0.32	C	RESID	COMM REC
7	.4 km west of BROCK RD TO .3 km east of BROCK RD (BROUGHAM)	0.7	4050	50		2	5	6	16	7.14	8.57	22.86	6	0.67	5.8	0.65	C	MIXED	COMM REC
7	S JCT HWY 12 TO NORTH ST (BROOKLIN)	1.3	5000	50		2	13	12	29	10	9.23	22.31	4.33	1	1.83	0.42	C	MIXED	COMM REC
7	FRONT ST TO 0.7 km S BURWAR RD S	2.0	6600	60		2	2	7	25	1	3.5	12.5	5.17	0.33	1.07	0.07	C	RESID	CNT-TR-REC

CATEGORY 5: LOW VOLUME, HIGH SPEED, TWO OR FOUR LANE FACILITIES

HWY	SECTION	LENGTH (km)	1984 AADT	POSTED SPEED (km/h)	ACTUAL SPEED (km/h)	No OF LANES	No OF ACCESS POINTS			ACCESS POINT DENSITY (/km)			No OF ACCIDENTS		ACCIDENT RATE		LEVEL OF SERVICE	ROADSIDE ENVIRONMENT	PEAKING PATTERN
							COMM	PUBLIC	RES	COMM	PUBLIC	RES	TOTAL	D.R.	TOTAL	D.R.			
7	1.6 km E YORK-DURHAM BDRY TO 0.4 km W BROCK RD	5.1	3150	80	100	2	5	11	29	0.98	2.16	5.69	8.67	1.33	1.48	0.23	C	RURAL	COMM REC

CATEGORY 6: VERY LOW VOLUME, HIGH SPEED, TWO OR FOUR LANE FACILITIES

HWY	SECTION	LENGTH (km)	1984 AADT	POSTED SPEED (km/h)	ACTUAL SPEED (km/h)	No OF LANES	No OF ACCESS POINTS			ACCESS POINT DENSITY (/km)			No OF ACCIDENTS		ACCIDENT RATE		LEVEL OF SERVICE	ROADSIDE ENVIRONMENT	PEAKING PATTERN
							COMM	PUBLIC	RES	COMM	PUBLIC	RES	TOTAL	D.R.	TOTAL	D.R.			
101	0.1 km S HWY 576 TO BRISTOL	5.0	2350	80	89	2	11	3	2	2.2	0.6	0.4	4.67	1.33	1.09	0.31	C	COMM	INTER CNTR
38	VERGNA TO MITCHINBROOKE - CPR X-ING	12.0	2500	80		2	2	12	31	0.166	1	2.583	11.67	3	2.86	0.58	C		COMM REC
38	MITCHINBROOKE - CPR X-ING TO TICHBORNE - CPR X-ING	13.1	2500	80		2	10	12	71	0.763	0.916	5.419	10.67	0.67	0.89	0.06	C		COMM REC
38	TICHBORNE - CPR X-ING TO CAMP OCONTO RD	3.7	1450	80		2	4	6	12	1.081	1.621	3.243	2	1.33	1.02	0.68	C		COMM REC

APPENDIX C

1 KM SECTIONS

CATEGORY 1

	COMM	PUBLIC	COMM+PUBL	RESID	# ACC	ACC RATE	AADT	LOS	PP	POSTED SPEED	ACTUAL SPEED	# LANES	ROADSIDE ENVIRON.
1	3	2	5	0	27.33	2.67	28000	D	SUB-CNTR	80	100	4	MIXED
2	3	2	5	0	10.33	1.01	28000	D	SUB-CNTR	80	100	4	MIXED
3	0	0	0	0	6.33	0.62	28000	D	SUB-CNTR	80	100	4	RURAL
4	4	2	6	0	5.67	0.55	28000	D	SUB-CNTR	80	100	4	COMM
5	1	2	3	3	15	1.47	28000	D	SUB-CNTR	80	100	4	RESID
6	1	4	5	1	36.67	3.72	27040	D	SUB-CNTR	80	100	4	RURAL
7	1	0	1	0	5.33	0.54	26800	D	SUB-CNTR	80	100	4	RURAL
8	1	5	6	15	37.99	3.72	28000	D	SUB-CNTR	80	100	4	RESID
9	2	4	6	6	40.99	4.01	28000	D	SUB-CNTR	80	100	4	MIXED
10	3	1	4	6	29.66	3.03	26800	D	SUB-CNTR	80	100	4	MIXED
11	3	2	5	1	30	2.58	31800	E	SUB-CNTR	80	100	4	COMM
12	1	3	4	1	26.34	2.27	26800	E	SUB-CNTR	80	100	4	RURAL
13	1	5	6	4	34.33	2.75	34200	E	SUB-CNTR	80	100	4	RESID
14	7	1	8	0	14.66	1.19	33800	E	SUB-CNTR	80	100	5	COMM
15	3	4	7	0	52	4.75	30000	C	SUB-CNTR	80	100	4	COMM
16	6	3	9	16	24.32	2.78	24000	C	SUB-CNTR	80	100	4	MIXED
17	1	3	4	7	27.66	3.83	20000	C	SUB-CNTR	80	100	4	RESID
18	3	1	4	12	3.68	1.01	10000	C	COMMUTER	80	97	4	RESID
19	1	2	3	8	5.99	1.64	10000	C	COMMUTER	80	97	4	RESID
20	0	1	1	8	1.33	0.36	10000	C	COMMUTER	80	97	4	RESID
21	4	3	7	5	19	3.42	15000	C	COMMUTER	80	100	4	MIXED
22	2	1	3	0	15	1.14	36200	D	URB-CNTR	80	100	4	COMM
23	0	6	6	0	46.67	4.26	30000	D	URB-CNTR	80	100	4	RURAL
24	2	3	5	0	33.67	4.16	22200	D	URB-CNTR	80	100	4	COMM
25	0	3	3	0	22.67	3.52	17600	D	URB-CNTR	80	100	4	RURAL
26	3	1	4	2	9.99	1.73	15800	D	URB-CNTR	80	100	4	MIXED
27	2	2	4	3	20	3.47	15800	D	URB-CNTR	80	100	4	MIXED
28	0	4	4	19	8.66	1.59	14900	C	COMMUTER	80	97	4	RESID
29	0	0	0	1	0.99	0.18	14900	C	COMMUTER	80	97	4	RURAL
30	5	2	7	14	5.33	0.98	14900	C	COMMUTER	80	97	4	MIXED

CATEGORY 2

	COMM	PUBLIC	COMM+PUBL	RESID	# ACC	ACC RATE	AADT	LOS	PP	POSTED SPEED	ACTUAL SPEED	# LANES	ROADSIDE ENVIRON.
1	1	2	3	1	36	2.79	35300	D	URB-CNTR	60	80	4	RURAL
2	4	2	6	3	13.34	0.96	38100	D	URB-CNTR	60	80	4	MIXED
3	3	2	5	0	10.99	1.2	25100	D	URB-CNTR	60	80	4	COMM
4	3	6	9	8	44.33	4.9	24800	D	URB-CNTR	60	80	4	MIXED
5	2	5	7	17	23.66	4	16200	D	INTER-CNTR	50	65	5	RESID
6	5	4	9	0	43.34	3.83	31000	D	URB-CNTR	50	65	5	COMM
7	10	13	23	17	10.68	3.33	8800	D	INTER-CNTR	60		4	MIXED
8	14	4	18	16	19.66	2.99	18000	D	INTER-CNTR	60		4	MIXED
9	13	10	23	0	28.65	3.17	24800	D	URB-CNTR	50		4	COMM
10	7	9	16	28	21.67	4.95	12000	D	INTER-CNTR	50		4	MIXED
11	7	6	13	28	24	3.65	18000	D	URB-CNTR	50		4	MIXED

CATEGORY 3

	COMM	PUBLIC	COMM+PUBL	RESID	# ACC	ACC RATE	AADT	LOS	PP	POSTED SPEED	ACTUAL SPEED	# LANES	ROADSIDE ENVIRON.
1	2	3	5	7	5.33	2.34	6250	E	COMMUTER	70	80	2	RESID
2	1	0	1	42	0.33	0.14	6250	E	COMMUTER	70	80	2	RESID
3	0	1	1	36	2.67	1.17	6250	E	COMMUTER	70	80	2	RESID
4	3	4	7	54	3.33	1.46	6250	E	COMMUTER	70	80	2	RESID
5	1	0	1	26	0	0.00	6250	E	COMMUTER	70	80	2	RESID
6	1	1	2	7	1.67	0.73	6250	E	COMMUTER	80	80	2	RESID
7	1	0	1	15	2.67	1.17	6250	E	COMMUTER	80	80	2	RESID
8	0	0	0	34	1.67	0.73	6250	E	COMMUTER	80	80	2	RESID
9	2	3	5	34	9	3.95	6250	E	COMMUTER	80	80	2	RESID
10	0	0	0	39	3	1.32	6250	E	COMMUTER	70	80	2	RESID
11	3	0	3	39	3.67	1.61	6250	E	COMMUTER	70	80	2	RESID
12	2	4	6	42	5	2.19	6250	E	COMMUTER	70	80	2	RESID
13	6	5	11	38	4.33	1.90	6250	E	COMMUTER	70	80	2	RESID
14	0	2	2	6	0	0.00	4000	E	INTER-COMM	80	95	2	RURAL
15	1	4	5	3	2.33	1.60	4000	E	INTER-COMM	80	95	2	RURAL
16	0	0	0	6	1.67	1.14	4000	E	INTER-COMM	80	95	2	RURAL
17	2	3	5	11	0.33	0.23	4000	E	INTER-COMM	80	95	2	RESID
18	0	0	0	4	0.67	0.46	4000	E	INTER-COMM	80	95	2	RESID
19	0	2	2	10	0.67	0.46	4000	E	INTER-COMM	80	95	2	RESID
20	1	2	3	3	0.67	0.30	6200	E	INTER-COMM	80	95	2	MIXED
21	5	2	7	2	2	0.88	6200	E	INTER-COMM	80	95	2	MIXED
22	1	3	4	4	16.67	5.50	8300	D	COMMUTER	80	100	2	RESID
23	2	0	2	5	1.33	0.44	8300	D	COMMUTER	80	100	2	RESID
24	2	2	4	2	4.33	1.43	8300	D	COMMUTER	80	100	2	RESID
25	0	1	1	3	3	0.99	8300	D	COMMUTER	80	100	2	RESID
26	0	2	2	1	10	3.30	8300	D	COMMUTER	80	100	2	RESID
27	3	0	3	4	2	0.66	8300	D	COMMUTER	80	100	2	RESID
28	0	3	3	7	1	0.33	8300	D	COMMUTER	80	100	2	RESID
29	0	0	0	5	3.33	1.10	8300	D	COMMUTER	80	100	2	RESID
30	1	3	4	1	4.33	1.46	8100	D	COMMUTER	80	100	2	RESID
31	3	1	4	5	2	0.68	8100	D	COMMUTER	80	100	2	RESID
32	0	3	3	4	3	1.01	8100	D	COMMUTER	80	100	2	RESID
33	0	1	1	4	3.33	1.13	8100	D	COMMUTER	80	100	2	RESID
34	3	3	6	16	3	0.81	10200	E	COMMUTER	80	97	2	RESID
35	0	4	4	6	4.67	1.25	10200	E	COMMUTER	80	97	2	RESID
36	0	0	0	7	2.33	0.63	10200	E	COMMUTER	80	97	2	RESID
37	4	4	8	22	8.67	2.33	10200	E	COMMUTER	80	97	2	RESID
38	0	2	2	5	9	2.16	11400	E	COMMUTER	80	97	2	RESID
39	1	2	3	1	0.33	0.21	4300	C	INTER-COMM	80	113	2	RURAL
40	1	2	3	6	1	0.64	4300	C	INTER-COMM	80	113	2	RURAL
41	0	1	1	4	0.67	0.43	4300	C	INTER-COMM	80	113	2	RURAL
42	1	2	3	4	2.67	1.70	4300	C	INTER-COMM	80	113	2	RURAL
43	3	0	3	3	2	1.37	4000	C	INTER-TOUR	80	97	2	RURAL
44	0	1	1	0	1	0.68	4000	C	INTER-TOUR	80	97	2	RURAL
45	1	0	1	3	2	1.37	4000	C	INTER-TOUR	80	97	2	RURAL
46	0	0	0	6	1.67	1.14	4000	C	INTER-TOUR	80	97	2	RURAL
47	0	0	0	3	2.33	1.60	4000	C	INTER-TOUR	80	97	2	RURAL
48	0	3	3	9	3.67	2.31	4350	C	INTER-COMM	90	90	2	RESID
49	1	2	3	2	1.67	1.05	4350	C	INTER-COMM	80	90	2	RESID
50	0	2	2	0	1	0.63	4350	C	INTER-COMM	80	90	2	RESID

CATEGORY 4

	COMM	PUBLIC	COMM+PUBL	RESID	# ACC	ACC RATE	AADT	LOS	PP	POSTED SPEED	ACTUAL SPEED	# LANES	ROADSIDE ENVIRON
1	17	8	25	15	7.01	1.89	10100	D	COMMUTER	50		2	MIXED
2	1	7	8	17	2	0.61	9000	D	COMMUTER	60		2	MIXED
3	4	2	6	17	1.33	0.90	4050	C	COMM REC	60		2	RESID
4	6	9	15	22	6.67	4.48	4050	C	COMM REC	50		2	MIXED
5	10	10	20	22	3.33	1.75	5200	C	COMM REC	50		2	MIXED
6	2	2	4	22	0	0.00	6600	C	CMT-TR-REC	60		2	RESID
7	0	4	4	8	0	0.00	6600	C	CMT-TR-REC	60		2	RESID

CATEGORIES 1 AND 2 COMBINED

	COMM	PUBLIC	COMM+PUBL	RESID	# ACC	ACC RATE	AADT	LOS	PP	POSTED SPEED	ACTUAL SPEED	# LANES	ROADSIDE ENVIRON.
VOLUME = 0 - 20.000 AADT													
1	10	13	23	17	10.68	3.33	8800	D	INTER-CMT	60		4	MIXED
2	1	2	3	8	5.99	1.64	10000	C	COMMUTER	80	97	4	RESID
3	3	1	4	12	3.68	1.01	10000	C	COMMUTER	80	97	4	RESID
4	0	1	1	8	1.33	0.36	10000	C	COMMUTER	80	97	4	RESID
5	7	9	16	28	21.67	4.95	12000	D	INTER-CMT	50		4	MIXED
6	0	0	0	1	0.99	0.18	14900	C	COMMUTER	80	97	4	RURAL
7	0	4	4	19	8.66	1.59	14900	C	COMMUTER	80	97	4	RESID
8	5	2	7	14	5.33	0.98	14900	C	COMMUTER	80	97	4	MIXED
9	4	3	7	5	19	3.42	15000	C	COMMUTER	80	100	4	MIXED
10	3	1	4	2	9.99	1.73	15800	D	URB-CMTR	80	100	4	MIXED
11	2	2	4	3	20	3.47	15800	D	URB-CMTR	80	100	4	MIXED
12	2	5	7	17	23.66	4	16200	D	INTER-CMT	50	65	5	RESID
13	0	3	3	0	22.67	3.52	17600	D	URB-CMTR	80	100	4	RURAL
14	14	4	18	16	19.66	2.99	18000	D	INTER-CMT	60		4	MIXED
15	7	6	13	28	24	3.65	18000	D	URB-CMTR	50		4	MIXED
VOLUME = 20.000 - 30.000 AADT													
1	1	3	4	7	27.66	3.83	20000	C	SUB-CMTR	80	100	4	RESID
2	2	3	5	0	33.67	4.16	22200	D	URB-CMTR	80	100	4	COMM
3	6	3	9	16	24.32	2.78	24000	C	SUB-CMTR	80	100	4	MIXED
4	13	10	23	0	28.65	3.17	24800	D	URB-CMTR	50		4	COMM
5	3	6	9	8	44.33	4.9	24800	D	URB-CMTR	60	80	4	MIXED
6	3	2	5	0	10.99	1.2	25100	D	URB-CMTR	60	80	4	COMM
7	3	1	4	6	29.66	3.03	26800	D	SUB-CMTR	80	100	4	MIXED
8	1	0	1	0	5.33	0.54	26800	D	SUB-CMTR	80	100	4	RURAL
9	1	3	4	1	26.34	2.27	26800	E	SUB-CMTR	80	100	4	RURAL
10	1	4	5	1	36.67	3.72	27040	D	SUB-CMTR	80	100	4	RURAL
11	4	2	6	0	5.67	0.55	28000	D	SUB-CMTR	80	100	4	COMM
12	0	0	0	0	6.33	0.62	28000	D	SUB-CMTR	80	100	4	RURAL
13	2	4	6	6	40.99	4.01	28000	D	SUB-CMTR	80	100	4	MIXED
14	1	5	6	15	37.99	3.72	28000	D	SUB-CMTR	80	100	4	RESID
15	3	2	5	0	27.33	2.67	28000	D	SUB-CMTR	80	100	4	MIXED
16	1	2	3	3	15	1.47	28000	D	SUB-CMTR	80	100	4	RESID
17	3	2	5	0	10.33	1.01	28000	D	SUB-CMTR	80	100	4	MIXED
VOLUME = OVER 30.000 AADT													
1	0	6	6	0	46.67	4.26	30000	D	URB-CMTR	80	100	4	RURAL
2	3	4	7	0	52	4.75	30000	C	SUB-CMTR	80	100	4	COMM
3	5	4	9	0	43.34	3.83	31000	D	URB-CMTR	50	65	5	COMM
4	3	2	5	1	30	2.58	31800	E	SUB-CMTR	80	100	4	COMM
5	7	1	8	0	14.66	1.19	33800	E	SUB-CMTR	80	100	5	COMM
6	1	5	6	4	34.33	2.75	34200	E	SUB-CMTR	80	100	4	RESID
7	1	2	3	1	36	2.79	35300	D	URB-CMTR	60	80	4	RURAL
8	2	1	3	0	15	1.14	36200	D	URB-CMTR	80	100	4	COMM
9	4	2	6	3	13.34	0.96	38100	D	URB-CMTR	60	80	4	MIXED

CATEGORY 3 AND 4 COMBINED

	COMM	PUBLIC	COMM+PUBL	RESID	# ACC	ACC RATE	AADT	LOS	PP	POSTED SPEED	ACTUAL SPEED	# LANES	ROADSIDE ENVIRON.
1	2	3	5	7	5.33	2.34	6250	E	COMMUTER	70	80	2	RESID
2	1	0	1	42	0.33	0.14	6250	E	COMMUTER	70	80	2	RESID
3	0	1	1	36	2.67	1.17	6250	E	COMMUTER	70	80	2	RESID
4	3	4	7	54	3.33	1.46	6250	E	COMMUTER	70	80	2	RESID
5	1	0	1	26	0	0.00	6250	E	COMMUTER	70	80	2	RESID
6	1	1	2	7	1.67	0.73	6250	E	COMMUTER	80	80	2	RESID
7	1	0	1	15	2.67	1.17	6250	E	COMMUTER	80	80	2	RESID
8	0	0	0	34	1.67	0.73	6250	E	COMMUTER	80	80	2	RESID
9	2	3	5	34	9	3.95	6250	E	COMMUTER	80	80	2	RESID
10	0	0	0	39	3	1.32	6250	E	COMMUTER	70	80	2	RESID
11	3	0	3	39	3.67	1.61	6250	E	COMMUTER	70	80	2	RESID
12	2	4	6	42	5	2.19	6250	E	COMMUTER	70	80	2	RESID
13	6	5	11	38	4.33	1.90	6250	E	COMMUTER	70	80	2	RESID
14	0	2	2	6	0	0.00	4000	E	INTER-COM	80	95	2	RURAL
15	1	4	5	3	2.33	1.60	4000	E	INTER-COM	80	95	2	RURAL
16	0	0	0	6	1.67	1.14	4000	E	INTER-COM	80	95	2	RURAL
17	2	3	5	11	0.33	0.23	4000	E	INTER-COM	80	95	2	RESID
18	0	0	0	4	0.67	0.46	4000	E	INTER-COM	80	95	2	RESID
19	0	2	2	10	0.67	0.46	4000	E	INTER-COM	80	95	2	RESID
20	1	2	3	3	0.67	0.30	6200	E	INTER-COM	80	95	2	MIXED
21	5	2	7	2	2	0.88	6200	E	INTER-COM	80	95	2	MIXED
22	1	3	4	4	16.67	5.50	8300	D	COMMUTER	80	100	2	RESID
23	2	0	2	5	1.33	0.44	8300	D	COMMUTER	80	100	2	RESID
24	2	2	4	2	4.33	1.43	8300	D	COMMUTER	80	100	2	RESID
25	0	1	1	3	3	0.99	8300	D	COMMUTER	80	100	2	RESID
26	0	2	2	1	10	3.30	8300	D	COMMUTER	80	100	2	RESID
27	3	0	3	4	2	0.66	8300	D	COMMUTER	80	100	2	RESID
28	0	3	3	7	1	0.33	8300	D	COMMUTER	80	100	2	RESID
29	0	0	0	5	3.33	1.10	8300	D	COMMUTER	80	100	2	RESID
30	1	3	4	1	4.33	1.46	8100	D	COMMUTER	80	100	2	RESID
31	3	1	4	5	2	0.68	8100	D	COMMUTER	80	100	2	RESID
32	0	3	3	4	3	1.01	8100	D	COMMUTER	80	100	2	RESID
33	0	1	1	4	3.33	1.13	8100	D	COMMUTER	80	100	2	RESID
34	3	3	6	16	3	0.81	10200	E	COMMUTER	80	97	2	RESID
35	0	4	4	6	4.67	1.25	10200	E	COMMUTER	80	97	2	RESID
36	0	0	0	7	2.33	0.63	10200	E	COMMUTER	80	97	2	RESID
37	4	4	8	22	8.67	2.33	10200	E	COMMUTER	80	97	2	RESID
38	0	2	2	5	9	2.16	11400	E	COMMUTER	80	97	2	RESID
39	1	2	3	1	0.33	0.21	4300	C	INTER-COM	80	113	2	RURAL
40	1	2	3	6	1	0.64	4300	C	INTER-COM	80	113	2	RURAL
41	0	1	1	4	0.67	0.43	4300	C	INTER-COM	80	113	2	RURAL
42	1	2	3	4	2.67	1.70	4300	C	INTER-COM	80	113	2	RURAL
43	3	0	3	3	2	1.37	4000	C	INTER-TOU	80	97	2	RURAL
44	0	1	1	0	1	0.68	4000	C	INTER-TOU	80	97	2	RURAL
45	1	0	1	3	2	1.37	4000	C	INTER-TOU	80	97	2	RURAL
46	0	0	0	6	1.67	1.14	4000	C	INTER-TOU	80	97	2	RURAL
47	0	0	0	3	2.33	1.60	4000	C	INTER-TOU	80	97	2	RURAL
48	0	3	3	9	3.67	2.31	4350	C	INTER-COM	80	90	2	RESID
49	1	2	3	2	1.67	1.05	4350	C	INTER-COM	80	90	2	RESID
50	0	2	2	0	1	0.63	4350	C	INTER-COM	80	90	2	RESID
51	17	8	25	15	7.01	1.89	10100	D	COMMUTER	50		2	MIXED
52	1	7	8	17	2	0.61	9000	D	COMMUTER	60		2	MIXED
53	4	2	6	17	1.33	0.90	4050	C	COMM REC	60		2	RESID
54	6	9	15	22	6.67	4.48	4050	C	COMM REC	50		2	MIXED
55	10	10	20	22	3.33	1.75	5200	C	COMM REC	50		2	MIXED
56	2	2	4	22	0	0.00	6600	C	CMT-TR-RE	60		2	RESID
57	0	4	4	8	0	0.00	6600	C	CMT-TR-RE	60		2	RESID